

# **HYBRID BACKPLANE with EXPANDER (CUB)**

## **USER'S MANUAL**

**P/N : 2RAKVI013101**

**Model : RS424-07 HYBRID-OCULINK EXP-BP MODULE**

Version : V1.2

## Revision History

| Version | Changes                                                      | Date       |
|---------|--------------------------------------------------------------|------------|
| V1.0    | Official Release                                             | 2021/02/18 |
| V1.1    | Revise host connectors pin definition and parts icon change. | 2022/01/06 |
| V1.2    | Change NVMe connector type                                   | 2022/10/30 |
|         |                                                              |            |

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## **Overview**

INWIN's 12G SAS3 Backplanes equipped with Broadcom 35x36R Expander provide an industry leading high performance and high stability of data transfer for storage server solution.

The backplanes support state-of-the art SAS3 12Gbps HDD/SSD and also backward compatible with SAS 6Gbps, SATA 6Gps and SATA 3Gps HDD/SSD. The backplane has 8 \* OcuLink (SFF-8621) connectors and 8\* U.2 (SFF-8639) connectors to accommodate 8 \* 2.5"NVMe SSDs per each backplane.

There are 3 MiniSAS HD (SFF-8643) wide ports on each backplane. one of them are defined as host ports for connecting to RAID/HBA cards and the other is defined as the cascade port for connecting to another backplane and/or storage enclosure (JBOD) by extending it to the rear panel of the chassis through a SFF-8643 to SFF8644 cable.

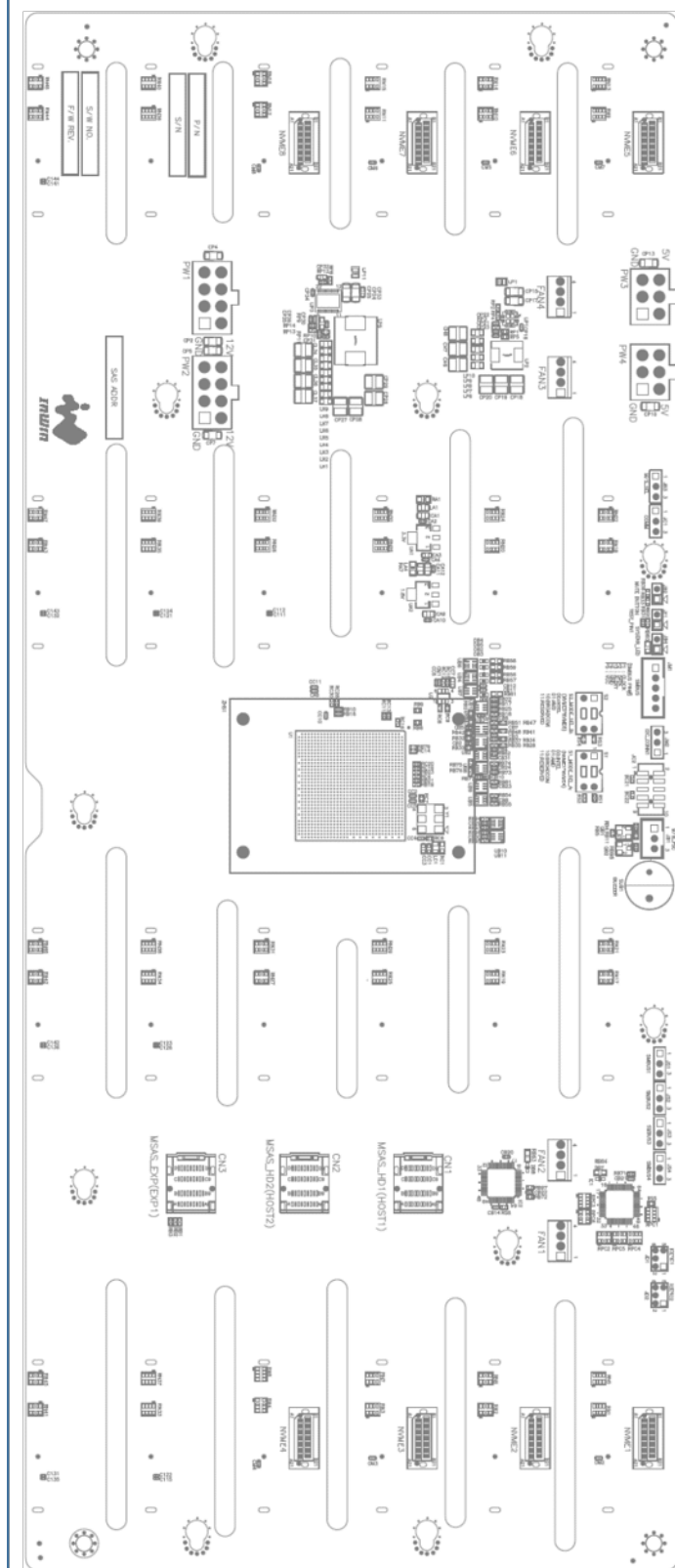
2 piece of 2\*3-Pin 5V and 2 piece of 2\*4-Pin 12V power receptacles support up to 5V(40A)/12V(60A) current to satisfy the power needs of fully loaded HDDs (24 HDDs depends on backplane model).

The backplane implemented with smart fan control feature to support wide variety of fan modules by auto-calibrating the installed fan modules at system boot. This feature provides an efficient way to control the thermal heat exhaustion by sensing the temperature on the backplane. The fan module speeds up and down upon the temperature rises and falls in the enclosure. Further, the backplane reserves a connector for adapting Fan PWM from motherboard so backplane can leverage PWM request from motherboard and behave according to the higher RPM number between MB and backplane.

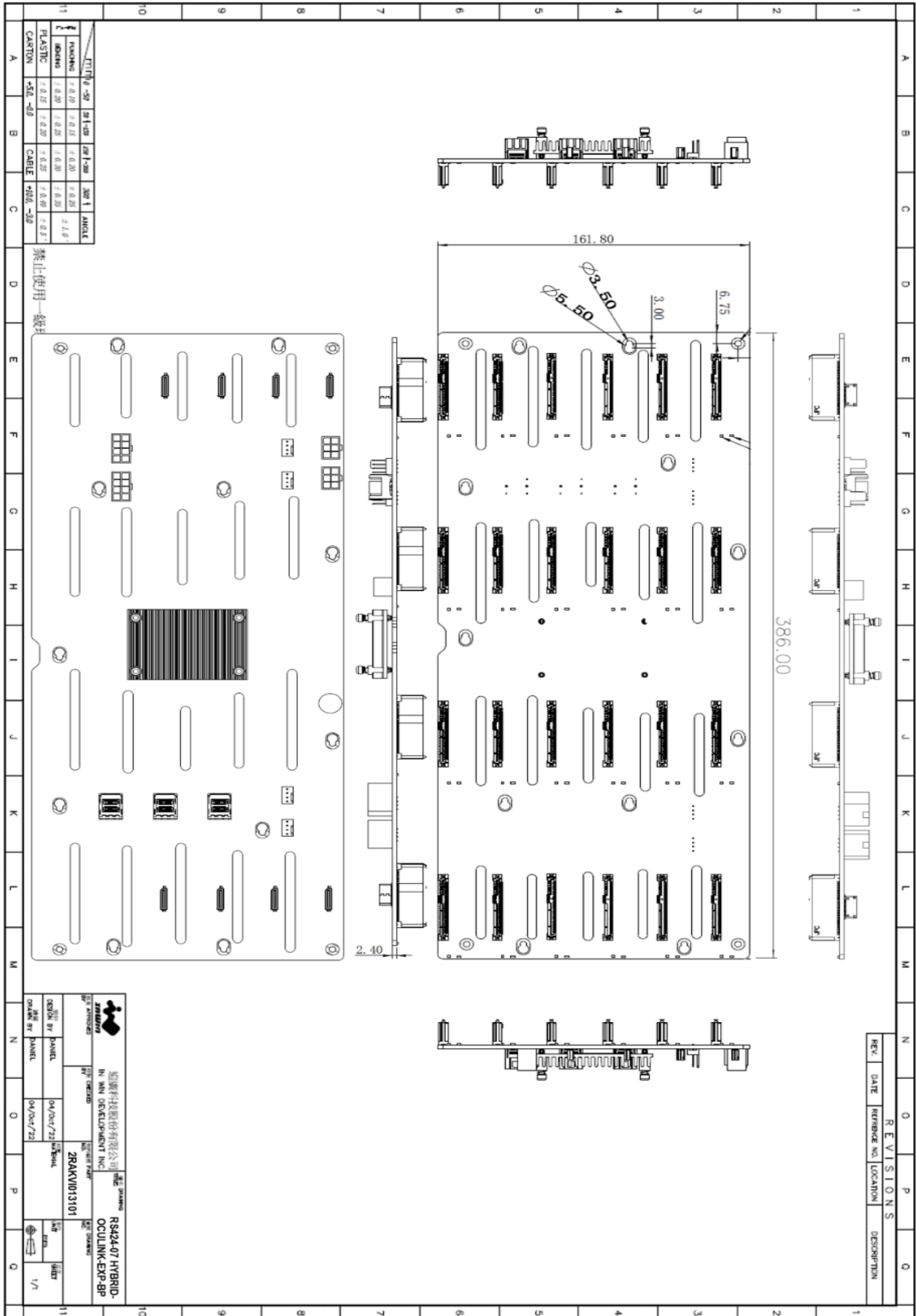
Along with the smart fan control feature, a system alarming feature is also implemented to alert users in case Fan module failure and/or system overheat occurs by illuminating the LED indicator. Users can then informed of issue and take corresponding actions to resolve the issue according to the failure type.



## BOTTOM VIEW

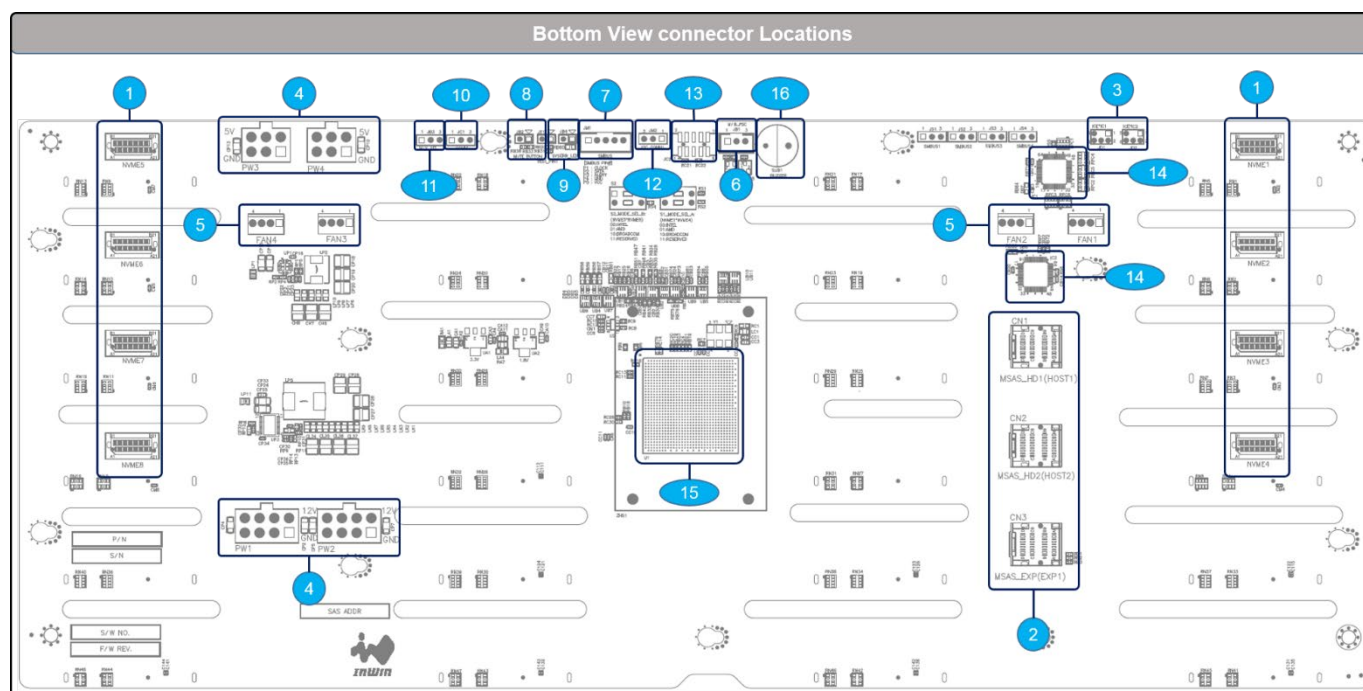


## Mechanical



## Connectors and Components

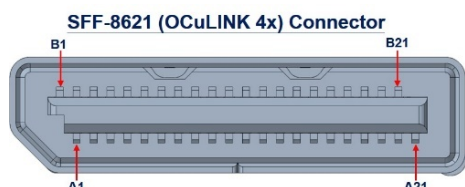
### Connector and Component Locations



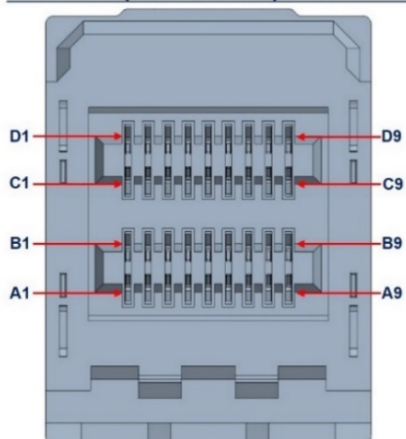
| No | Description                                | No | Description                       |
|----|--------------------------------------------|----|-----------------------------------|
| 1  | Host facing interface : NVME1~NVME8        | 9  | System_Fail LED: JB4              |
| 2  | Host facing interface (SAS3) : CN1/CN2/CN3 | 10 | M/S Communication Connector : JC1 |
| 3  | Firmware Programming Header : JD1          | 11 | M/S BP Selection Header : JB3     |
| 4  | Main Power Connector : PW1/2,PW3/4         | 12 | I2C Header : JM2                  |
| 5  | FAN Connector : FAN1~FAN4                  | 13 | Firmware Programming Header : JC2 |
| 6  | M/B Fan Speed Control : JB1                | 14 | M058 Micro-controller : IC1       |
| 7  | SMBUS Connector : JM1                      | 15 | SAS35x36R Expander chip : U1      |
| 8  | Mute_Button : JB2                          | 16 | Buzzer: SUB1                      |

### Connector Pin Definitions.

| NVME1~NVME8                                     |         |             |         |
|-------------------------------------------------|---------|-------------|---------|
| Signal Name                                     | Pin No. | Signal Name | Pin No. |
| PET0_[p/n]                                      | B3/B4   | PER0_[p/n]  | A3/A4   |
| PET1_[p/n]                                      | B6/B7   | PER1_[p/n]  | A6/A7   |
| PET2_[p/n]                                      | B15/B16 | PER2_[p/n]  | A15/A16 |
| PET3_[p/n]                                      | B18/B19 | PER3_[p/n]  | B18/B19 |
| GND : B2/B5/B8/B14/B17/B20/A2/A5/A8/A14/A17/A20 |         |             |         |
| Signal Name                                     | Pin No. | Signal Name | Pin No. |
| BP_Type/Wake#                                   | B9/B10  | PERST#      | A12     |
| RefClk[p/n]                                     | B12/B13 | SMB_CLK/DAT | A9/A10  |
| Sideband_GND : A11/B11                          |         |             |         |

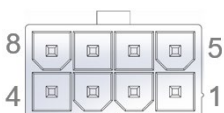


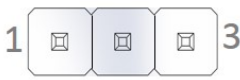
### SFF-8643 (MiniSAS HD) Connector



### CN1/CN2/CN3

| Signal Name                                  | Pin No.  | Signal Name   | Pin No.  |
|----------------------------------------------|----------|---------------|----------|
| SAS_TX0_[p/n]                                | D4/D5    | SAS_RX0_[p/n] | B4/B5    |
| SAS_TX1_[p/n]                                | C4/C5    | SAS_RX1_[p/n] | A4/A5    |
| SAS_TX2_[p/n]                                | D7/D8    | SAS_RX2_[p/n] | B7/B8    |
| SAS_TX3_[p/n]                                | C7/C8    | SAS_RX3_[p/n] | A7/A8    |
| SAS_GND                                      | D3/D6/D9 | SAS_GND       | B3/B6/B9 |
| SAS_GND                                      | C3/C6/C9 | SAS_GND       | A3/A6/A9 |
| Sideband Definition :                        |          |               |          |
| S0_SClock: A1, S1_SLoad: B1, S4_DataOut: C2, |          |               |          |
| S5_DataIn: D2, S6/S7 Reserved: A2/D1,        |          |               |          |
| S2_GND: C1, S3_GND: B2,                      |          |               |          |

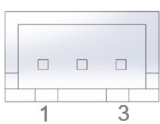
| PW1/PW2                                                                           | Power 2*4-Pin Connector |            | PW3/PW4                                                                            | Power 2*3-Pin Connector |            |
|-----------------------------------------------------------------------------------|-------------------------|------------|------------------------------------------------------------------------------------|-------------------------|------------|
|  | PIN #                   | Definition |  | PIN #                   | Definition |
|                                                                                   | 1~4                     | Ground     |                                                                                    | 1~3                     | Ground     |
|                                                                                   | 5~8                     | +12V       |                                                                                    | 4~6                     | +5V        |

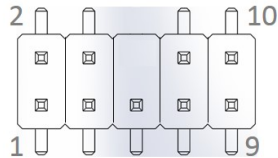
| JS1~JS4                                                                             | VPP over I2C Header |            | JM2                                                                                  | I2C Header |            |
|-------------------------------------------------------------------------------------|---------------------|------------|--------------------------------------------------------------------------------------|------------|------------|
|  | PIN #               | Definition |  | PIN #      | Definition |
|                                                                                     | 1                   | SMB_Clock  |                                                                                      | 1          | I2C_Clock  |
|                                                                                     | 2                   | SMB_Data   |                                                                                      | 2          | I2C_Data   |
|                                                                                     | 3                   | Ground     |                                                                                      | 3          | Ground     |

| JB2                                                                                 | MUTE_BUTTON Header |               | JB4                                                                                 | SYS_ERR_LED Header |               |
|-------------------------------------------------------------------------------------|--------------------|---------------|-------------------------------------------------------------------------------------|--------------------|---------------|
|  | PIN #              | Definition    |  | PIN #              | Definition    |
|                                                                                     | 1                  | MUTE_BUTTON_+ |                                                                                     | 1                  | SYS_ERR_LED_+ |
|                                                                                     | 2                  | MUTE_BUTTON_- |                                                                                     | 2                  | SYS_ERR_LED_- |

| JB3                                                                                 | M/S Selection-Header |            | JB3 Function Description:                                                                                                                     |  |
|-------------------------------------------------------------------------------------|----------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | PIN #                | Definition | <b>[JB3 Function]</b><br>Setting                      Function<br>1-2 Short                  Master BP<br>2-3 Short                  Slave BP |  |
|                                                                                     | 1                    | Master_BP  |                                                                                                                                               |  |
|                                                                                     | 2                    | SEL_COM    |                                                                                                                                               |  |
|                                                                                     | 3                    | Slave_BP   |                                                                                                                                               |  |

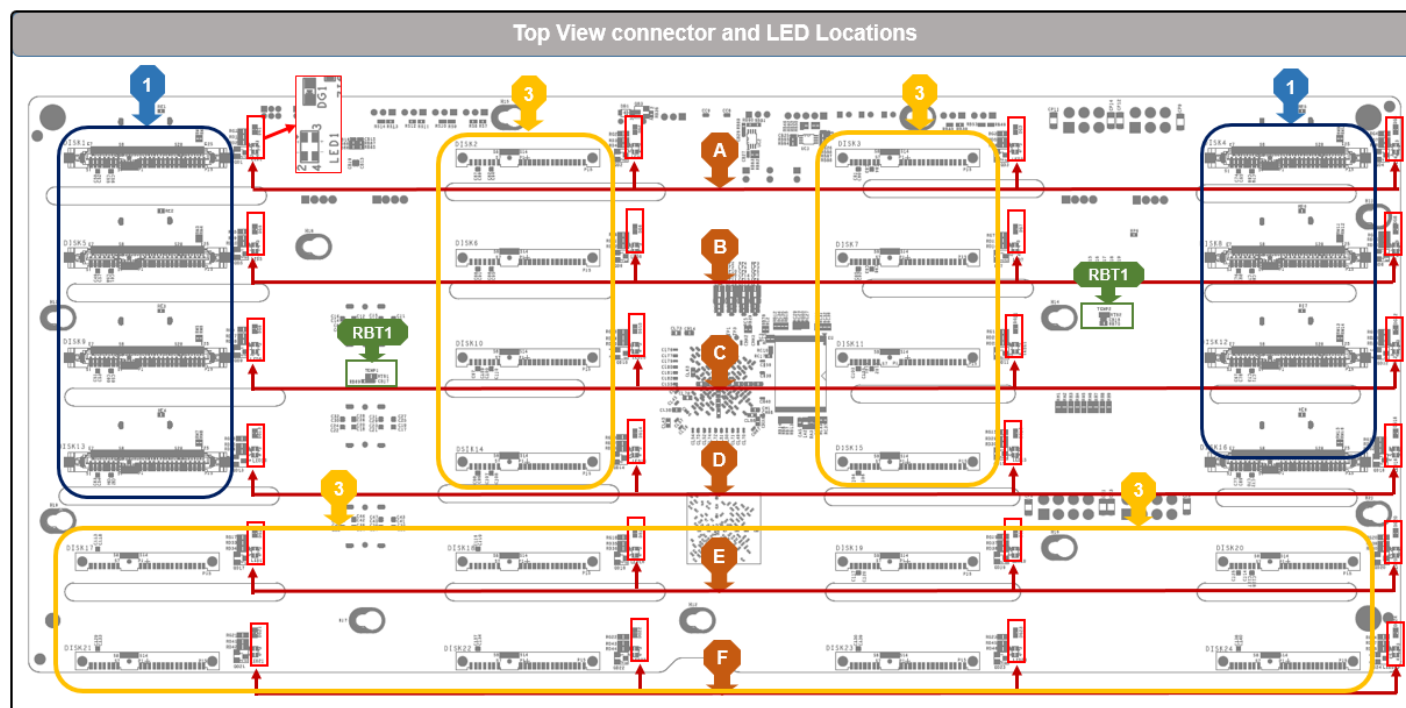
| FAN1~FAN4                                                                           | FAN 4-Pin Connector |            | JC1                                                                                  | M/S Comm. 3-Pin Header |            |
|-------------------------------------------------------------------------------------|---------------------|------------|--------------------------------------------------------------------------------------|------------------------|------------|
|  | PIN #               | Definition |  | PIN #                  | Definition |
|                                                                                     | 1                   | Ground     |                                                                                      | 1                      | LINK_Clock |
|                                                                                     | 2                   | +12V       |                                                                                      | 2                      | LINK_Data  |
|                                                                                     | 3                   | Tachometer |                                                                                      | 3                      | Ground     |
|                                                                                     | 4                   | PWM Output | For Master & Salve BP Communication                                                  |                        |            |

| JB1                                                                               | M/B FSC 3-Pin Connector |                                    | JM1    | SMBUS Connector |            |
|-----------------------------------------------------------------------------------|-------------------------|------------------------------------|--------|-----------------|------------|
|                                                                                   | PIN #                   | Definition                         |        | PIN #           | Definition |
|                                                                                   | 1                       | PWM_FROM_MB                        |        | 1               | Clock      |
|                                                                                   | 2                       | TACH_TO_MB                         |        | 2               | Data       |
|  |                         | 3                                  | Ground | 3               | Alert      |
|                                                                                   |                         | For Motherboard FAN Speed Control. |        | 4               | Ground     |
|                                                                                   |                         |                                    |        | 5               | Vcc        |

| JC2                                                                               | LSI35X36R Firmware Programming Connector |            |       |            |
|-----------------------------------------------------------------------------------|------------------------------------------|------------|-------|------------|
|                                                                                   | PIN #                                    | Definition | PIN # | Definition |
|  | 1                                        | SDB_TX     | 2     | +1.8V      |
|                                                                                   | 3                                        | SDB_RX     | 4     | Ground     |
|                                                                                   | 5                                        | UART_TX    | 6     | #KEY       |
|                                                                                   | 7                                        | UART_RX    | 8     | Ground     |
|                                                                                   | 9                                        | Ground     | 10    | +3.3V      |
|                                                                                   |                                          |            |       |            |

| JD1/JD2                                                                           | MCU Firmware Programming Connector |            |         |            |
|-----------------------------------------------------------------------------------|------------------------------------|------------|---------|------------|
|                                                                                   | PIN #                              | Definition | PIN No# | Definition |
|  | 2                                  | ICE_CLK    | 1       | VCC        |
|                                                                                   | 4                                  | ICE_DATA   | 3       | #Key       |
|                                                                                   | 6                                  | ICE_RST    | 5       | Ground     |

## Connector Locations and LED Indicators

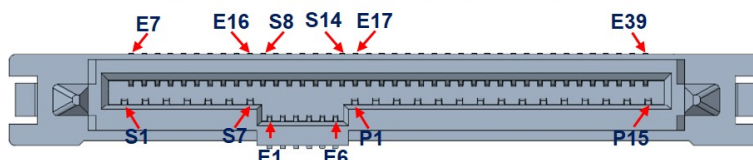


## Connector Locations.

| No | Location                                 | Description                                                      |
|----|------------------------------------------|------------------------------------------------------------------|
| 1  | DISK1/5/9/13                             | NVMe SSD or SATA/SAS Disk #1/#2#3/#4                             |
| 1  | DISK4/8/12/16                            | NVMe SSD or SATA/SAS Disk #4/#8#12/#16                           |
| 2  | DISK2/3/6/7/10/11/14/15<br>DISK17~DISK24 | SATA/SAS Disk #2/#3#6/#7/#10/#11#14/#15<br>SATA/SAS Disk #17~#24 |

### DISK1/5/9/13,DISK4/8/12/16

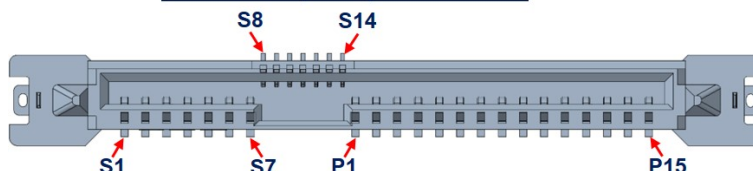
#### SFF-8639 (U.2) Connector



| Signal Name  | Pin No.                                | Signal Name | Pin No.                       | Signal Name | Pin No. | Signal Name  | Pin No. |
|--------------|----------------------------------------|-------------|-------------------------------|-------------|---------|--------------|---------|
| SAS0Tx[p/n]  | S2/S3                                  | SAS0Rx[p/n] | S5/S6                         | SAS1Tx[p/n] | S9/S10  | SAS1Rx[p/n]  | S12/S13 |
| PET0 [p/n]   | E10/E11                                | PET1 [p/n]  | S17/S18                       | PET2 [p/n]  | S23/S24 | PET3 [p/n]   | E17/E18 |
| PER0 [p/n]   | E13/E14                                | PER1 [p/n]  | S20/S21                       | PER2 [p/n]  | S26/S27 | PER3 [p/n]   | E20/E21 |
| PCEI_GND     | E9/E12/E15/S16/S19/S22/S25/S28/E19/E22 | SAS_GND     | S1/S4/S7/S8/S11/S14/P5/P6/P12 |             |         |              |         |
| RefClk1[p/n] | E1/E2                                  | 3.3V_AUX    | E3                            | EPERST#1/2  | E4/E5   | RefClk0[p/n] | E7/E8   |
| HPT0/HPT1    | E16/S15                                | SMB_Clock   | E23                           | SMB_Data    | E24     | DualPortEn   | E25     |
| WAKE#        | P1                                     | SPCIE_RST   | P2                            | CLK_REQ#    | P3      | IFDET#1/2    | P4/E6   |
| +5V&Charge   | P7~P9                                  | 12V&Charge  | P13~P15                       | PRSNT       | P10     | READ_LED     | P11     |

### DISK2/3/6/7,DISK10/11/14/15,DISK17~DISK24

#### SFF-8680 (SAS) Connector



| Signal Name  | Pin No.             | Signal Name | Pin No.          | Signal Name | Pin No. | Signal Name | Pin No. |
|--------------|---------------------|-------------|------------------|-------------|---------|-------------|---------|
| SAS0Tx[p/n]  | S2/S3               | SAS0Rx[p/n] | S5/S6            | SAS1Tx[p/n] | S9/S10  | SAS1Rx[p/n] | S12/S13 |
| SAS_GND      | S1/S4/S7/S8/S11/S14 | Power_GND   | P4/P5/P6/P10/P12 |             |         |             |         |
| +3.3V&Charge | P1~P3               | +5V&Charge  | P7~P9            | 12V&Charge  | P13~P15 | READ_LED    | P11     |

## LED Indicators.

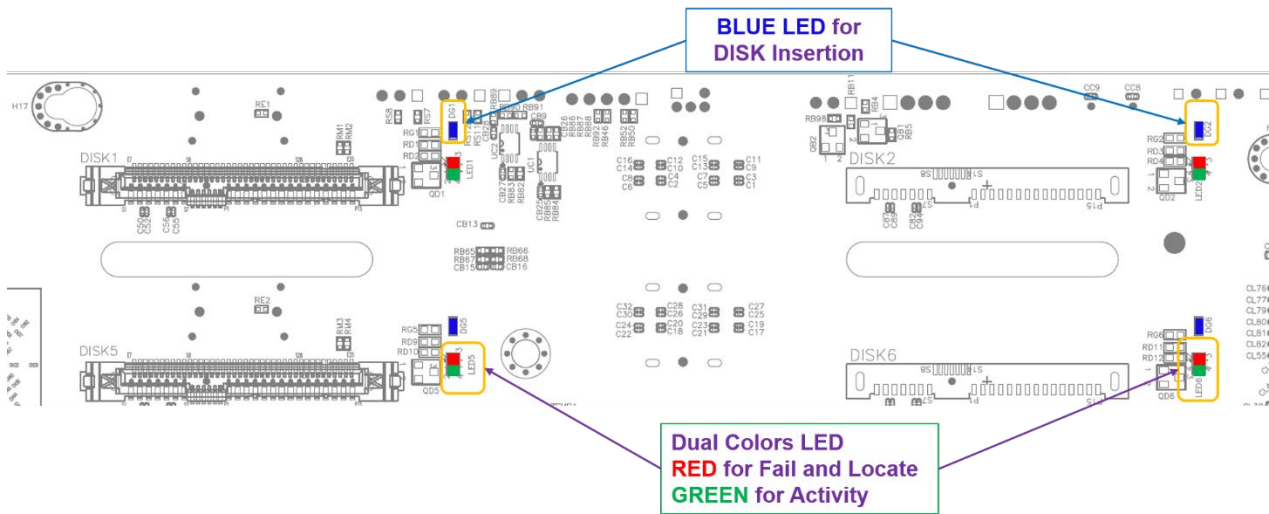
| No | Location                          | Description - Power LED                 |
|----|-----------------------------------|-----------------------------------------|
| A  | DG1,DG5,DG9,DG13,DG17,DG21        | DISK1,DISK5,DISK9,DISK13,DISK17,DISK21  |
| B  | DG2,DG6,DG10,DG14,DG18,DG22       | DISK2,DISK6,DISK10,DISK14,DISK18,DISK22 |
| C  | DG3,DG7,DG11,DG15,DG19,DG23       | DISK3,DISK7,DISK11,DISK15,DISK19,DISK23 |
| D  | DG4,DG8,DG12,DG16,DG20,DG24       | DISK4,DISK8,DISK12,DISK16,DISK20,DISK24 |
| No | Location                          | Description - Activity,Failure LED      |
| A  | LED1,LED5,LED9,LED13,LED17,LED21  | DISK1,DISK5,DISK9,DISK13,DISK17,DISK21  |
| B  | LED2,LED6,LED10,LED14,LED18,LED22 | DISK2,DISK6,DISK10,DISK14,DISK18,DISK22 |
| C  | LED3,LED7,LED11,LED15,LED19,LED23 | DISK3,DISK7,DISK11,DISK15,DISK19,DISK23 |
| D  | LED4,LED8,LED12,LED16,LED20,LED24 | DISK4,DISK8,DISK12,DISK16,DISK20,DISK24 |

## **Hardware Specification**

- HOST Interface : MiniSAS HD/OCulink
- Hard Disk (SSD) Interface : SATA/SAS3/NVMe
- Indicator :
  - Power LED \*24 (DG1~DG24): Steady Blue (When HDD is resented)
  - Dual color(Green/Red) LED \*24 (LED1~LED24) for HDD Status (Activity/Fail/Locate)
    - ◆ Activity LED: Blinking Green (When HDD is Access)
    - ◆ Locate LED : Blinking Red (When HDD Fail or Locate)
    - ◆ Fail LED : Steady Red (When HDD Fail or Locate)
- Environment Control :
  - PWM FAN Connector (FAN1~FAN4) for Cooling system.
  - Temperature Sensor (RTB1/RTB2) Monitor HDD bay inside temperature.
  - Buzzer (SUB1) for Over-temperature and FAN fail alerting.
- High Speed Connector
  - SFF-8643 MiniSAS HD Connector \*3 ( Host \*2, Extension \*1)
  - SFF-8621 OCULINK 42PIN Connector \*8 (NVME1~NVME8)
  - SFF-8680 SAS29Pin Connector \*8 for (DISK2/3/6/7/10/11/14/15,DISK17~24) SATA/SAS3 Disk.
  - SFF-8639 U.2 68Pin Connector \*8 (DISK1/5/9/13,DISK4/8/12/16) for SATA/SAS3 Disk or NVMe SSD.
- Power/Signal Connector
  - P4.2mm Disk Drive Power Connector\*4 (PW1/2[+12V]\*2/PW3/4[+5V]\*2).
  - JB1 connector for Fan speed control connected between Motherboard and backplane.
  - MUTE\_BUTTON (JB2) to mute the warning beeping.
  - M/S\_SEL(JB3) set BP to master or slave.
  - SYS\_ERR\_LED (JB4) Turn on when system Fan fails or system over temperature.
  - JC1 M/S Link Connector for Synchronous signal connection between two backplane.
  - DBG/UART (JC2) Use for firmware upgrade and debugging purpose.
  - JD1/JD2 Header for Programming MCU Firmware.
  - JM1 SMBUS Connector for external SMBUS control function.
  - I2C Header (JM2) for external I2C control function.
  - VPP over I2C (JS1~JS4) Header for NVMe status LED indication.

## LED Behavior

### Disk Bay LED



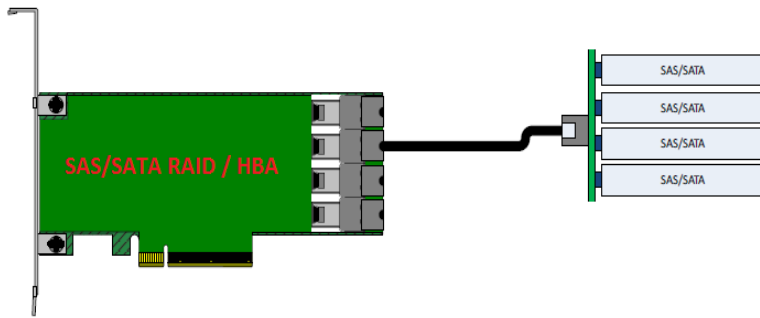
**Blue LED:**  
Disk Insertion Indicator –  
Turned on whenever disk drive is properly installed.

**Green LED:**  
Activity indicator –  
Stay off when idle and blinking (~8 Hz) whenever disk drive is being accessed.

**RED LED:**  
Fail and Locate indicator –  
Turned steady on when disk failure occurs. Blinking (1 Hz) when locating Disk, RAID rebuild and RAID consistent check.

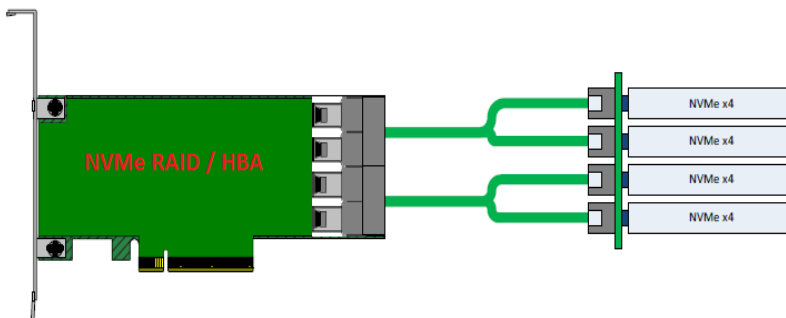
There are 2 parts of LED Management on the backplane. One is for SAS and another is for NVMe. Please note that the disk slots can only accommodate SAS/SATA or NVMe disk at a time since they share the same disk connector.

For SAS application, The LEDs behave by following SGPIO signal coming through sideband bus inside the SFF-8643 cables. Please refer to Section 2 for SGPIO settings. When SGPIO Jumper setting is enabled the LEDs behave according to the SGPIO signals. When SGPIO is disabled, the RED LEDs (for Locate and Fail) do not behave while the GREEN LEDs (for Activity) behave according to the signal from P11 (READY LED) of the disk connectors.



For NVMe application, The LEDs behave according to the VPP over I2C signals from NVMe host controllers through sideband bus of Oculink or SlimSAS cables. Whenever the NVMe host controller support VPP over I2C, the RED LEDs behave Locate, Fail and Rebuild signals following VPP signals on the I2C bus. The Green LEDs (for Activity) behave according to the signal from P11 (Activity) of the disk connectors.

Examples of NVMe connections to Broadcom RAID/HBA controller. Each pair of VPP over I2C signal supports 2 pieces of NVMe disks LED management. The I2C bus is leaded to odd-number NVMe connector (Oculink or SlimSAS) to manage its corresponding and the following NVMe disks. For example, NVMe1 and NVMe2 LED management signal is form NVMe1 connector's sideband I2C bus, NVMe3 and NVMe4 LED management signal is from NVMe3 connector's sideband I2C bus and ...etc.

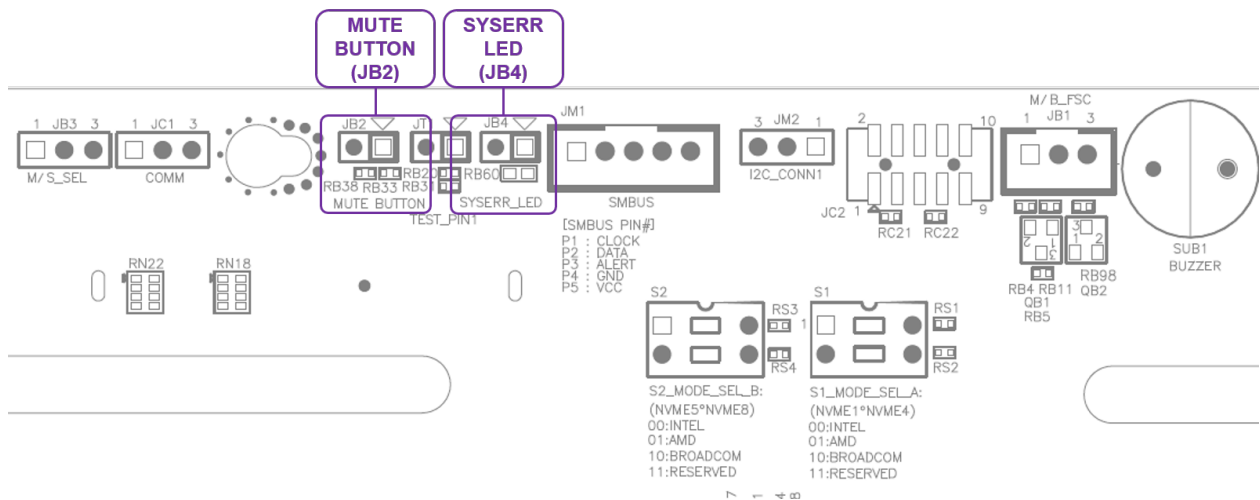


Basically, The LEDs behave following the SES control signal from RAID card when working in SAS/SATA mode. Below is the design SPEC of the Disk indicators.

| SES Status                                                                                                                                                                                                                                                               | Status Description                               | Red LED (Error)     | Green LED (Activity) | Priority (Hex) | SES Control                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------|----------------------|----------------|-----------------------------------------------------|
| <b>Power-On State (before SES client intervening)</b>                                                                                                                                                                                                                    |                                                  |                     |                      |                |                                                     |
| Forced Condition Cleared                                                                                                                                                                                                                                                 | Empty slot or disk unplugged                     | Off                 | Off                  | 10             | N/A (SEP internal)                                  |
| Condition Cleared                                                                                                                                                                                                                                                        | Disk loaded or inserting                         | Off                 | ActFlash             | 12             | N/A (SEP internal)                                  |
| <b>Informative</b>                                                                                                                                                                                                                                                       |                                                  |                     |                      |                |                                                     |
| OK                                                                                                                                                                                                                                                                       |                                                  | Off                 | ActFlash             | 11             | RQST OK                                             |
| Device Off                                                                                                                                                                                                                                                               | Power down phy or bay                            | Off                 | Off                  | 10             | RQST DEVICE OFF                                     |
| Reserved Device Hot Spare Do Not Remove                                                                                                                                                                                                                                  | Usually for RAID members                         | Off                 | ActFlash             | 0E             | RQST RSVD DEVICE<br>RQST HOT SPARE<br>DO NOT REMOVE |
| <b>Activity</b>                                                                                                                                                                                                                                                          |                                                  |                     |                      |                |                                                     |
| Consistence Check (Cons Chk)                                                                                                                                                                                                                                             | Check RAID consistence                           | <b>Blink_1</b>      | ActFlash             | 03             | RQST CONS CHECK                                     |
| Rebuild/Remap (disk array)                                                                                                                                                                                                                                               | Spare disk summoned for critical RAID rebuild    | <b>Blink_1</b>      | ActFlash             | 03             | RQST REBUILD/REMAP                                  |
| Active (Activity)                                                                                                                                                                                                                                                        |                                                  | Off                 | ActFlash             | 10             | RQST ACTIVITY                                       |
| <b>Warning &amp; Error</b>                                                                                                                                                                                                                                               |                                                  |                     |                      |                |                                                     |
| In Critical Array                                                                                                                                                                                                                                                        | Members in degraded RAID                         | Off                 | ActFlash             | 06             | RQST IN CRIT ARRAY                                  |
| In Failed Array                                                                                                                                                                                                                                                          | Members in broken RAID                           | <b>On</b>           | ActFlash             | 07             | RQST IN FAILED ARRAY                                |
| Rebuild/Remap Aborted (R/R Abort)                                                                                                                                                                                                                                        | Spare disk summoned for RAID rebuild yet aborted | <b>On</b>           | ActFlash             | 05             | RQST R/R ABORT                                      |
| Fault                                                                                                                                                                                                                                                                    |                                                  | <b>On</b>           | ActFlash             | 04             | RQST FAULT                                          |
| Missing                                                                                                                                                                                                                                                                  |                                                  | <b>On</b>           | ActFlash             | 04             | RQST MISSING                                        |
| Predict Failing (Fault Sensed)                                                                                                                                                                                                                                           | Dying disk detected by enclosure                 | <b>On</b>           | ActFlash             | 05             | COMMON CONTROL<br>PRDFAIL                           |
| <b>Identify &amp; Prompt</b>                                                                                                                                                                                                                                             |                                                  |                     |                      |                |                                                     |
| Identify/Locate                                                                                                                                                                                                                                                          |                                                  | <b>Slow_Blink_1</b> | ActFlash             | 00             | RQST IDENT                                          |
| Ready to Insert                                                                                                                                                                                                                                                          |                                                  | Off                 | ActFlash             | 0B             | RQST INSERT                                         |
| Ready to Remove (RMV)                                                                                                                                                                                                                                                    | Disk spun down                                   | Off                 | ActFlash             | 0C             | RQST REMOVE                                         |
| <b>Note:</b>                                                                                                                                                                                                                                                             |                                                  |                     |                      |                |                                                     |
| <ul style="list-style-type: none"> <li>• <b>Blink_1</b> : 50% On and then Off in a one second circle</li> <li>• <b>Slow_Blink_1</b> : 50% On and then Off in a 2 seconds circle</li> <li>• <b>ActFlash</b> : Stay off while idle and fast flash upon I/O load</li> </ul> |                                                  |                     |                      |                |                                                     |

## System Alarm

There is a system error LEDs designed on the Backplane to indicate system Error including system Fan Fail and Over-Temperature.



### System Fail Indicator:

JB3 is the jumper for system Fail Indicator. The System Fail indicator on the front panel connect to this jumper to indicate system fan fails or system overheat when it occurs.

### Fan Fail:

When the Fan RPM is lower than 50% of the expected speed the indicator goes ON. And it would go off when the issue is resolved or not existed.

### Overheat:

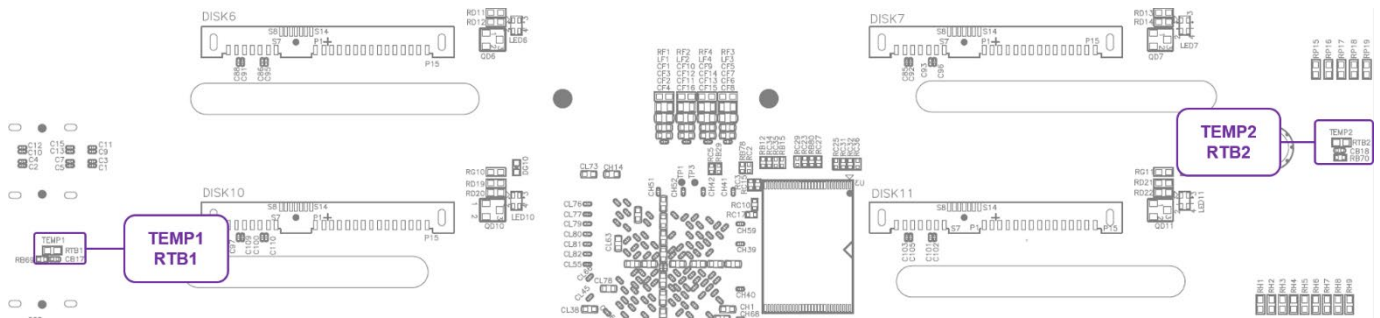
When the system temperature at the backplane area is going beyond 45°C the System Fail LED is turned ON. And would be turned off when temperature is going under 44°C

### Note:

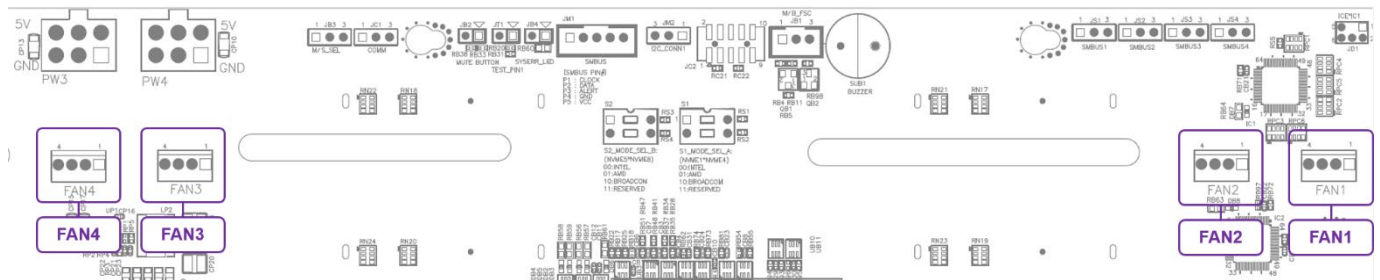
- ◆ When the system alarm is triggered, the Buzzer beeps along with it and stops beeping when alarm is disappear.
- ◆ 1 short beep stands for Fan Fails
- ◆ 2 short beeps stand for Over-Temperature
- ◆ Press Mute Button to disable buzzer beeps and will be retrigged when either system error occurs again.

## Smart Fan Control

IN WIN's Backplane is implemented Smart Fan Control feature by automatically detecting the existences of the Fan Modules and intelligently control the Fan RPM per the system temperature being detected by two thermal sensors (RTB1/RTB2) on the backplane.



Thanks to Smart Fan Control feature the Fan connectors (FAN1/FAN2/FAN3/FAN4) on backplane support wide variety of PWM driven Fan modules being used in the enclosure.

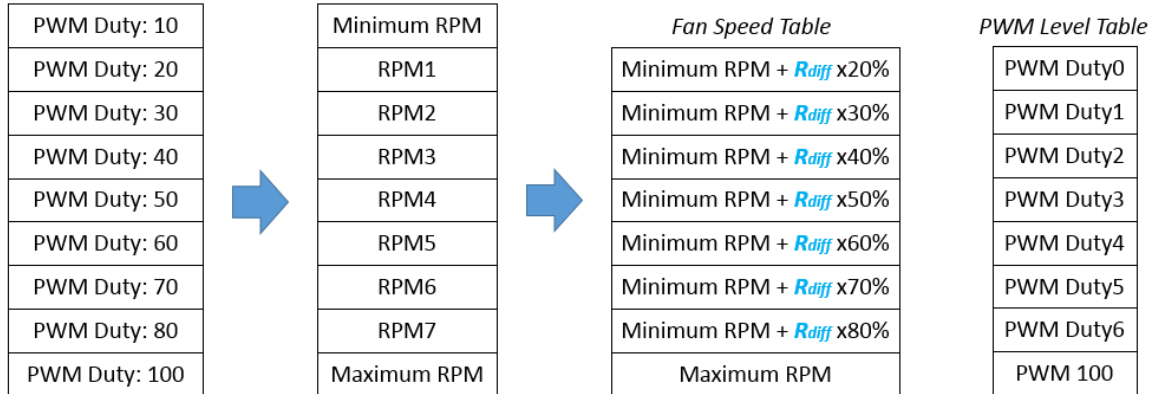


How it works?

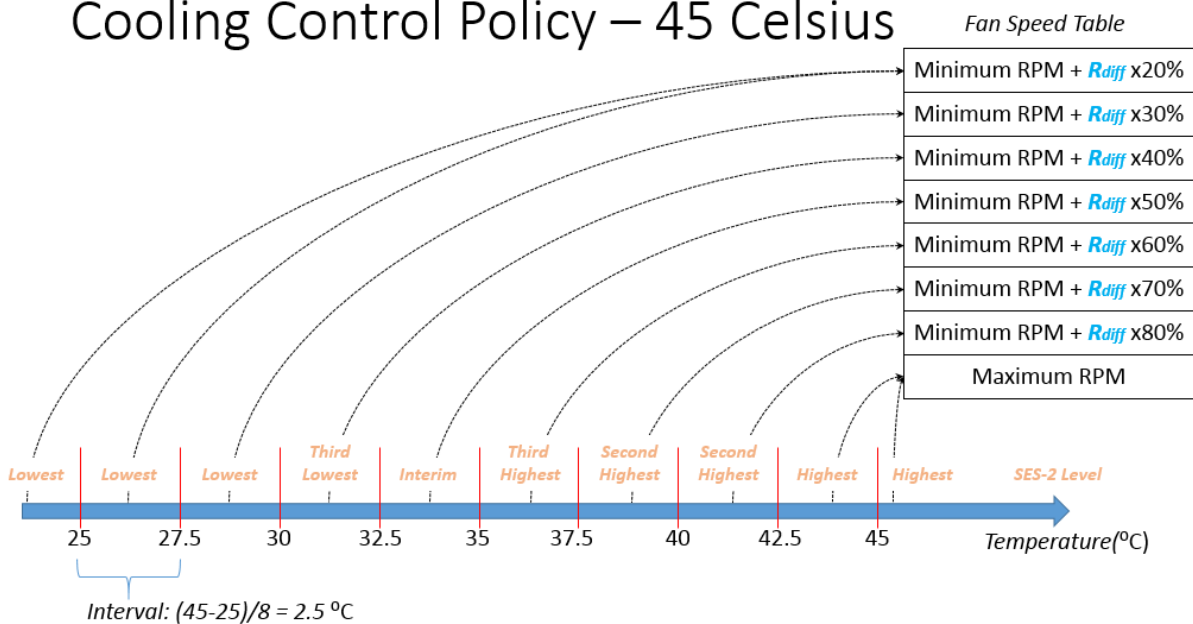
1. Fan module auto-calibration triggered in every system boot. The thermal profile would then be recorded and used until next reboot.
2. Backplane starts fan calibration and calculates the corresponding PWM duty cycle for each level. There are totally 8 speed levels to be sensed and used until next system boot.
3. The 8 levels of fan speed are mapped to the temperature readings detected by thermistor spreading from 25 to 45 °C in 3.75 degree C step.
4. In normal operation, when the system temperature changes to next level, the fan module would change speed accordingly. And, the Fan failure alarm would be triggered when the RPM of the Fan module is dropped lower than 75% of its expected speed.
5. The fan module calibration and thermal profile are as below.
6. When an external PWM source joins, the output PWM duty is determined by comparing the internal calculated PWM and external PWM and then select whichever is higher as the output PWM to the fan modules.

## Fan Speed Measurement

$$R_{diff} = \text{Maximum RPM} - \text{Minimum RPM}$$



## Cooling Control Policy – 45 Celsius



## **Firmware Upgrade**

### **Expander Chipset SAS35x36R Firmware Upgrade Description**

The SAS3 backplane equipped with firmware upgrade feature through serial console in case it is required. There are 2 firmware to be upgraded. One is Expander system firmware and another is system configuration data. They are not necessarily to be upgraded at the same time. Either one can be upgraded independently when required.

How to upgrade firmware?

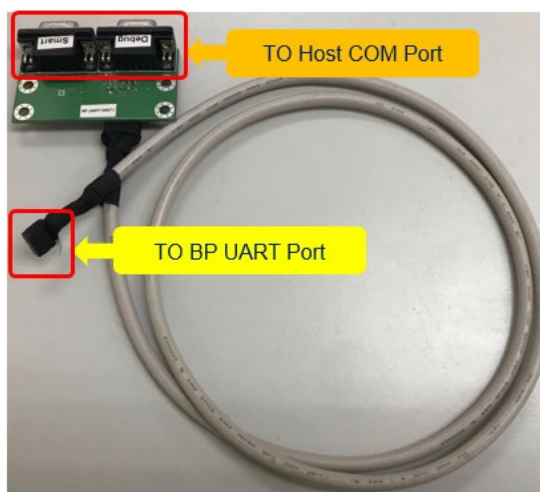
1. Out-Of-Band through serial console
2. In Band through SCSI Command

### **Out-Of-Band through serial console**

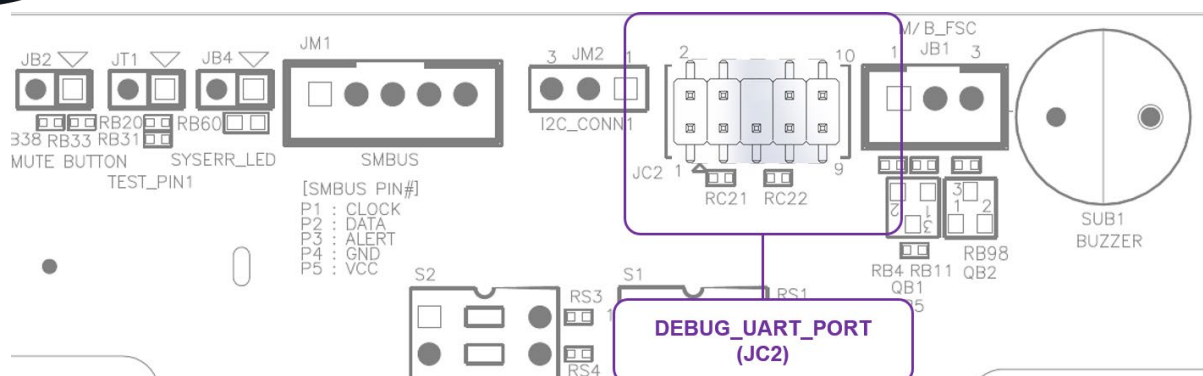
IN WIN's SAS-3 12Gps Backplane implements a serial UART port allowing users to conduct firmware upgrade through it.

1. Require a proprietary serial cable IN WIN made.

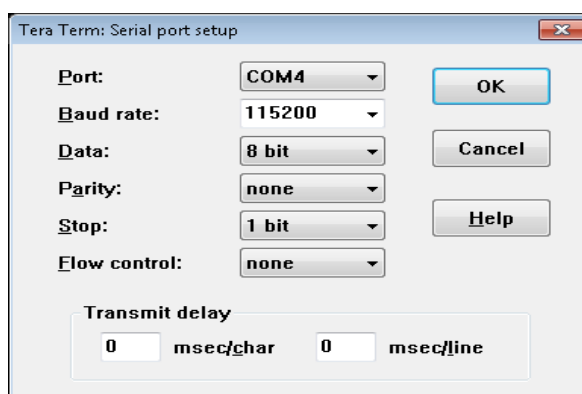
Please note that the connector to Backplane varies depends on the backplane. The 07 series backplane UART port is redesigned with smaller form factor.



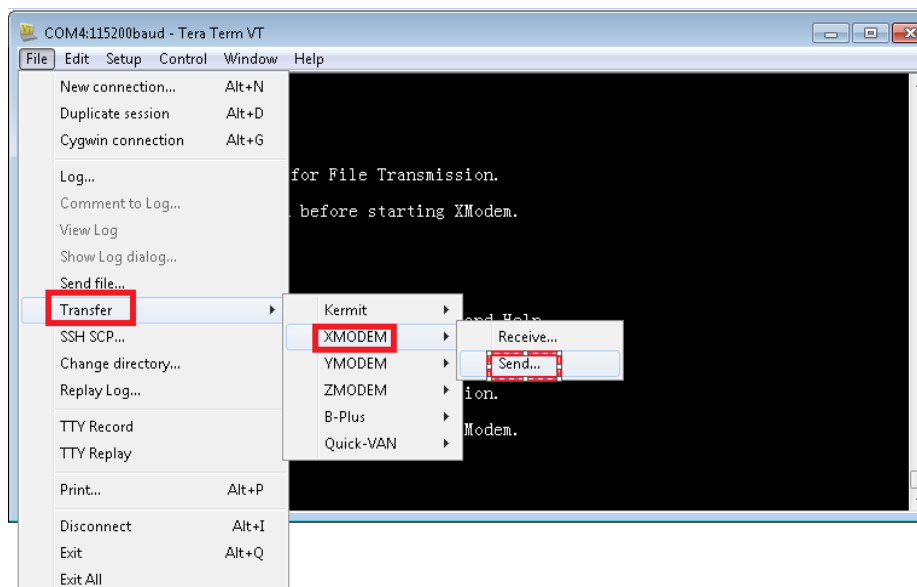
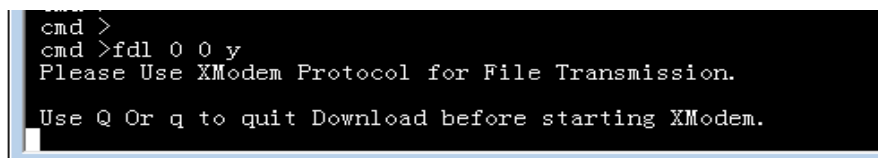
2. Require a host with a serial COM port.
3. Connect serial cable between Backplane and host.

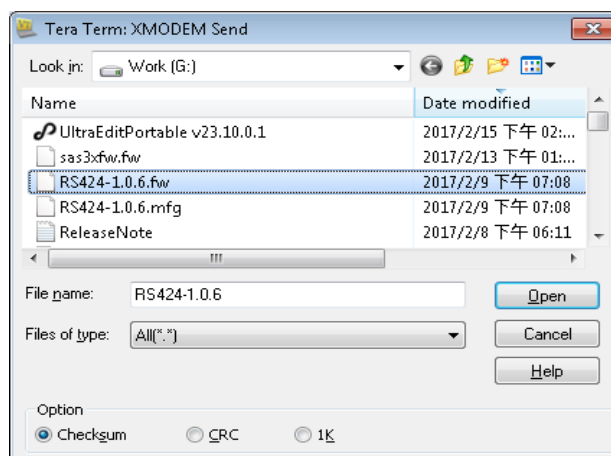


4. Configure serial port setting as 115200, N, 8, 1.

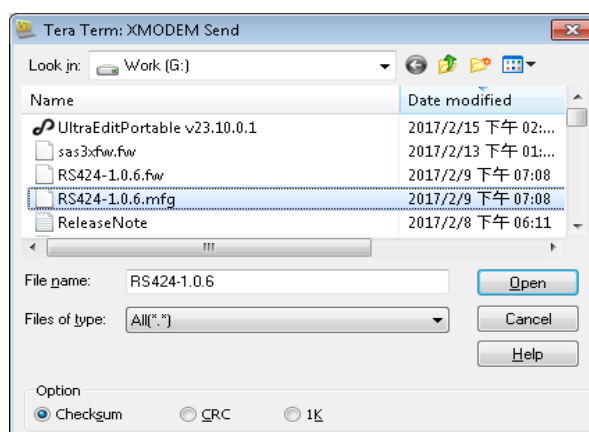
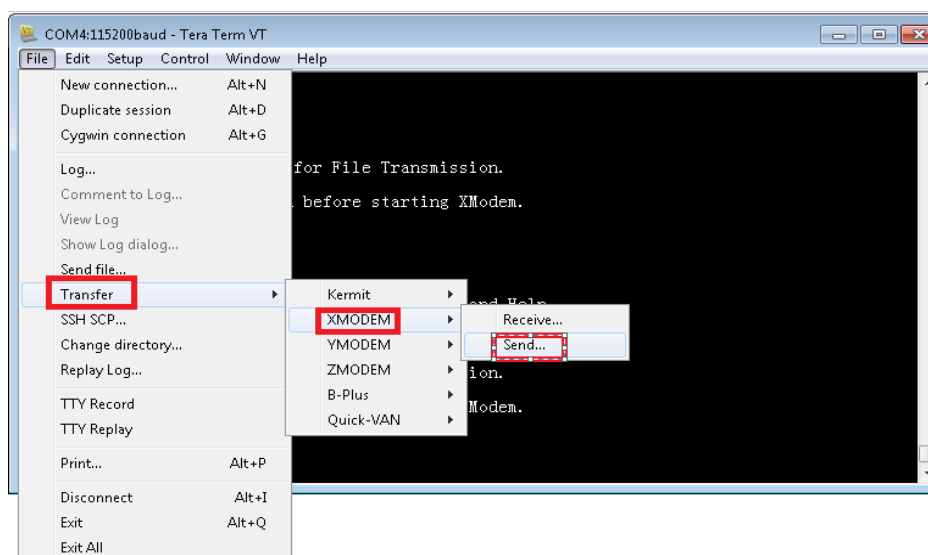
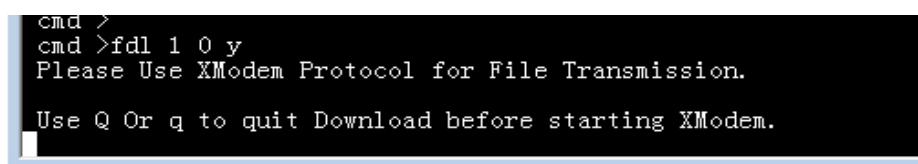


5. Command “fdl 0 0 y” for system firmware upgrade in serial console. Sending system firmware through Xmodem.





6. Command “fdl 1 0 y” in serial console for system configuration data upgrade. Sending system firmware through Xmodem.



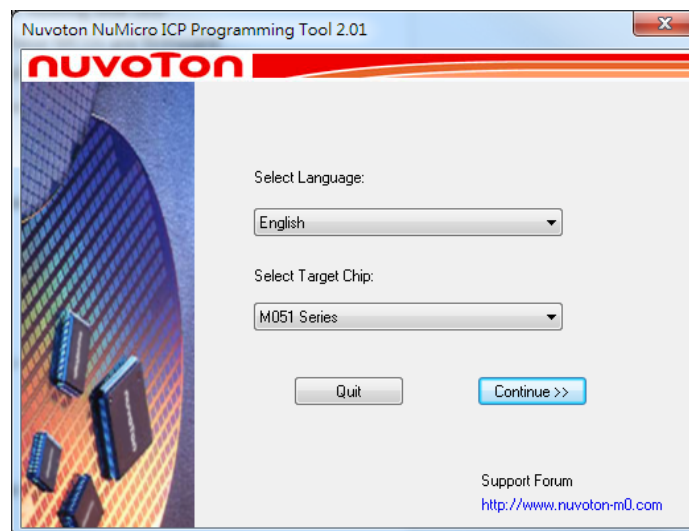
7. Reset system by typing “reset” command in serial console or power cycle to make new firmware take effect.

## M058 Micro-controller Firmware Upgrade Description

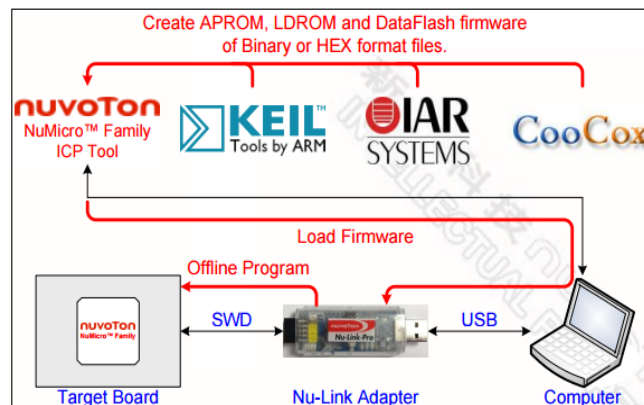
The passive backplanes are planted Nuvoton M058 series MCUs for hosting disk LED indication, Fan speed control and system fail alarm. These MCUs are preprogrammed in manufacturing. In most cases, the MCUs are not required to reprogram unless there is issue needed to fix.

How to upgrade firmware?

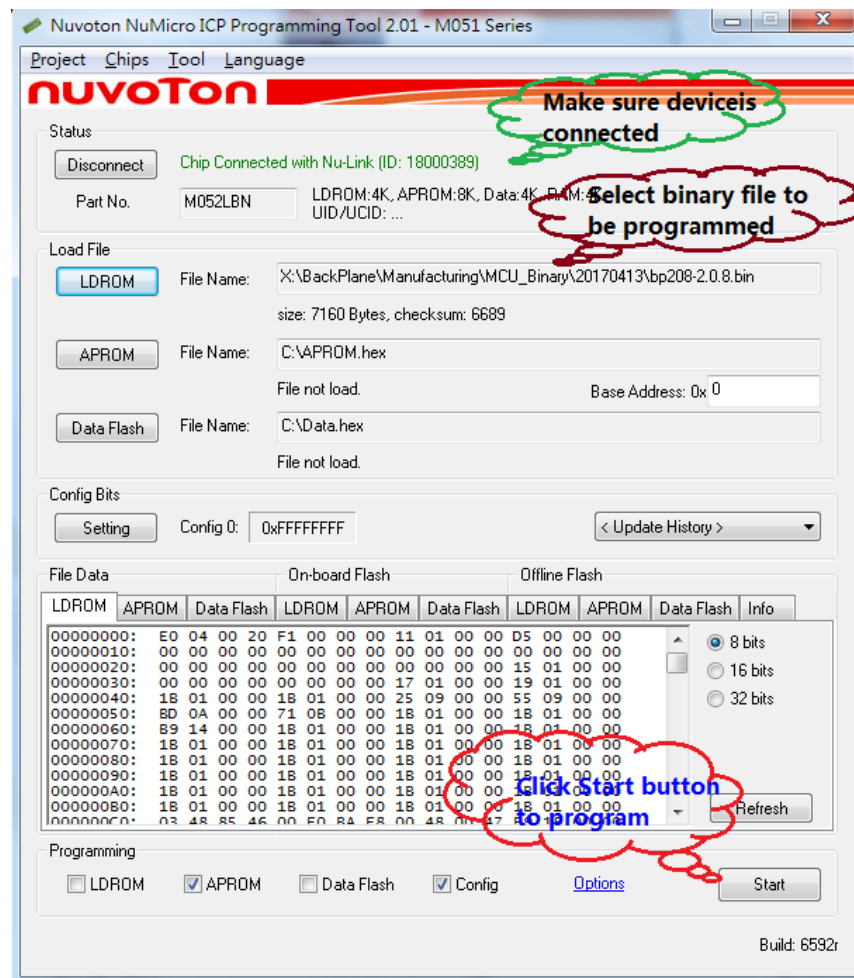
1. Require Nuvoton ARM Cortex-M0 programming tool. Nu-Me or Nu-Link and install Nuvoton ICP Programming tool software.



2. Connect Nu-Link USB end to a host and the SWD end to Backplane ICE connector for each MCU.



3. Make sure device is connected and select the binary file being programmed and then click on Start button to program firmware.



4. Please refer to [http://www.nuvoton.com/resource-files/NuLink\\_Adapter\\_User\\_Manual\\_EN\\_V1.01.pdf](http://www.nuvoton.com/resource-files/NuLink_Adapter_User_Manual_EN_V1.01.pdf) for more details.

## Management

To manage backplane, users can connect a serial console cable to backplane or expander UART through RS232 COM port on system host. Refer to **Out-Of-Band through serial console** (Page14) for the details of the serial console cable and the console terminal setting.

There are some useful commands for users to check expander status, conduct firmware update and debug issue when required.

## Useful Console Commands

| Function                          | Command                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| help                              | To list the usage of the CLI commands                                                                                                                                                                                                                                                                                                                                                                                              |
| Show/Set the current              | date [ set <newdate(*)> ]                                                                                                                                                                                                                                                                                                                                                                                                          |
| Reset the expander                | reset [watchdog]                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Display phy info.                 | phyinfox [ -i [(1 .. NumBpc) ] ] -s<br>-i : show phy info of BPC expander<br>-s : show SES Array Device info of CSE BRC<br>(bridge console only)                                                                                                                                                                                                                                                                                   |
| Configuration update              | fdl 1 0 y<br>Download and Update MFG configuration.<br>(feed it with 'MFG image file')                                                                                                                                                                                                                                                                                                                                             |
| Firmware Update                   | Fdl 0 0 y<br>Download and update firmware                                                                                                                                                                                                                                                                                                                                                                                          |
| Display info for all phys         | phyinfo [help edfb power cable]<br>[up <PhyNum(D)>]<br>- no arguments displays default output<br>- 'help' displays detailed help information<br>- 'edfb' subcommand displays EDFB info<br>- 'power' subcommand displays power mgmt info<br>- 'up' filters to display connected phys only<br>- 'cable' subcommand displays cable mgmt info<br>- <PhyNum> is a valid phy index and filters the output to display info about that phy |
| Display or reset all phy counters | counters [config event reset]<br>- no arguments displays phy error counters and generic broadcast counters<br>- 'config' subcommand displays phy event configuration<br>- 'event' subcommand displays phy event counters<br>- 'reset' subcommand resets all phy counters                                                                                                                                                           |
| Display expander SAS address      | sasaddr [-d]<br>('-d': also show virtual ports address)                                                                                                                                                                                                                                                                                                                                                                            |
| Show POST info                    | showpost                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Show MFG revision                 | showmfg                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Show firmware revision            | rev                                                                                                                                                                                                                                                                                                                                                                                                                                |